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## MAVAL POSTGRADUATE SCHOOL

Monterey, California







AN AMBIENT AIR QUALITY MODEL FOR ASSESSMENT OF U.S. NAVAL AVIATION EMITTANTS

G. R. Thompson and D. W. Netzer

September 1976

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Prepared for: Naval Air Propulsion Test Center Trenton, New Jersey

## NAVAL POSTGRADUATE SCHOOL Monterey, California

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model and these parametric studies are discussed.

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#### I. INTRODUCTION

Public awareness of the environment and its quality, and governmental concern for the public health and welfare, have resulted in substantial environmental legislation in the last fifteen years. Federal air quality legislation culminated in 1970 with the creation of the Environmental Protection Agency (EPA). This agency was charged with developing and implementing national air quality standards. In 1971 air quality standards were prescribed for carbon monoxide, hydrocarbons, nitrogen dioxide, particulate matter, sulfur dioxide and photochemical oxidants \( \subseteq \text{Ref. 1\_7.} \)

Both the Air Quality Act of 1967 and the Clean Air Act of 1970 refer to aircraft emissions as a possible source contributing to air pollution. In 1973 emission standards and test procedures were prescribed for commercial aircraft engines by the EPA \_Ref. 2\_7. The EPA was concerned with pollution of the lower atmosphere by combustion products produced by commercial aircraft. The lower atmosphere was defined to extend from ground level to three thousand feet. Aircraft operations were defined in terms of a landing and take off operational cycle time-in-mode (LTO). Techniques were prescribed for measuring emissions during a simulated LTO, and engine specifications were defined by engine thrust category based on engine type and date of manufacture.

The goal of the EPA is the prevention of degradation of ambient air quality. An accurate quantification of emissions and their distribution throughout a local environment is required to assess the impact of any emission source on air quality. Once quantification is accomplished, the predicted ambient air quality can be compared to EPA requirements, and control procedures, if warranted, can be instituted by the operating agency/corporation. Mathematical models which simulate aircraft, air base and off air base activities provide the most flexible approach to quantifying emissions by source and to distributing these emissions over a grid of receptors for determination of ambient air quality.

There have been several major modeling efforts which are concerned with air quality as affected by aircraft operations. An early model was developed by Northern Research and Engineering Corporation (NREC) / Ref. 3\_7. This model provided the basis for development of the GEOMET Model / Ref. 4\_7. The GEOMET Model significantly modified and improved the NREC model and has been validated to some extent by measurements at the Washington National Airport. Military air operations may differ significantly from civilian air operations. To this end Argonne National Laboratory has been contracted by the USAF to develop a computer model based on the TRW "Air Quality Display Model" (AQDM) / Ref. 5\_7 to estimate the concentrations of pollutants throughout a theoretical grid of receptors over a period of time. Under this contract Argonne has developed a preliminary version of "A Generalized Air Quality

Assessment Model for Air Force Operations" (AQAM), which brings together several models of different pollution sources and will serve as a device for assessing environmental air quality / Ref. 6\_7.

The above models include emission and dispersion programs. There are some differences between the GEOMET and AQAM models. These differences are primarily in the areas of source representation and dispersion parameter specification.

Argonne's original contract included 12 specific tasks [Ref. 6]. Among them was a generalization and update modification of AQDM to obtain long-term average calculations which included military aircraft landings and take-offs as a source of emissions. In addition they were to develop a short-term model which performed hourly calculations and an inventory model which summarized annual emissions at an activity by source.

Standards proposed by the EPA for civil aviation do not apply to the military. However both the United States Air Force (USAF) and the United States Navy (USN) have, in a spirit of cooperation, proceeded to establish a data base for engine emissions \_Ref. 7 and 8\_7 and to specify LTO cycles consistent with their respective aircraft operations \_Ref. 9 and 10\_7.

The USAF data base and LTO cycles were incorporated into the air quality assessment model developed by Argonne. This model may be used to assess the impact on air quality of aircraft operations, to evaluate the effect of modifications of aircraft operations on air quality, to determine the qualitative importance of aircraft, air base and environ (off air base) emission sources, to provide an estimate of local ambient air quality and to optimize the location of receptors for model verification.

"Liason between the Air Force Weapons Laboratory at Kirkland AFB, New Mexico, the Naval Air Propulsion Test Center (NAPTC) at Trenton, New Jersey, and the Naval Postgraduate School, Monterey, California" stimulated USN interest in the capabilities of the Argonne model. Accordingly a copy of both the Source Inventory and Short-term pollution models were obtained for evaluation and adaptation to USN operations \( \subseteq \text{Ref. 10\_7.} \)

Substantial modifications were made by LCDR Keith I. Weal to adapt the Argonne model to USN aircraft operations \_Ref. 10\_7. An LTO cycle is defined by the number of operational modes required to complete the cycle. The EPA utilizes ten, and the USAF eleven, operational modes to define an LTO cycle. These cycles are restricted to a vertical plane and do not define operational modes which are peculiar to the USN. Reference 10 defines a USN LTO cycle to consist of sixteen operational modes including such USN vagaries as "hot refueling" and Field Carrier Landing Practice (FCLP). Naval aircraft operations are dictated, even when based ashore, by the demanding (often unforgiving) shipboard environment. This shipboard environment requires substantial low altitude, high intensity operations to ensure

combat readiness. Therefore, LCDR Weal expanded the simulations of aircraft flight from two to three dimensions.

The present study completed adaptation of the Argonne model to Navy operations and used this version of the model to assess the relationship between aircraft operations, air base activity and off air base activity on ambient air quality at the Miramar Naval Air Station (NAS).

#### II. MODEL OVERVIEW

AQAM is composed of a Source Inventory Program, a Meteorological Data Program, a Short-term Emission Dispersion Program and a Long-term Emission Dispersion Program / Ref. 6 7. The Source Inventory Program produces an annual source emission inventory and creates a data bank of temporal distribution arrays, source geometries, and source operational activity factors which are utilized by both the Long- and Short-term Programs. "The Short-term Program computes hourly average air pollutant concentrations using hourly average meteorological and emission data" / Ref. 67. The Long-term Program computes monthly or annual average air pollutant concentrations utilizing emission data and historical meteorological records. The Meteorological Data Program is used only as input to the Long-term Program. Only the Source Inventory Program and the Short-term Emission Dispersion Program are being modified to provide an air quality assessment model for Naval air operations.

The Source Inventory Program computes the annual emissions of three categories of sources: aircraft, airbase but non aircraft, and environment (off air base). Each category is further divided by its geometric configuration into point sources, area sources and line sources Ref. 10\_7.

After the spatial configuration of the source is defined the emission plume is located in three-dimensional space and the mass emission rate of each pollutant emitted by the source is

determined from source activity data and appropriate emission factors [Ref. 6.7.

Aircraft sources which define the Navy LTO cycle are listed in Table I. Aircraft flight and taxi operations are simulated by finite line sources. Aircraft servicing, delays and pre-flight checks are simulated by area sources.

Aircraft sources include all emissions due directly to aircraft operations and servicing. The operational characteristics and servicing requirements of aircraft are dependent on aircraft type. Therefore, the emissions from aircraft operations and servicing are calculated from unique operational data which define various modes of operation and differentiate between aircraft types, taxi paths, parking areas, refueling procedures and runways.

Commercial and military air operations are always supported by an air base. Air base sources are defined as those sources producing emissions due directly to non-aircraft base activities and include all base support facilities, training facilities, service facilities, housing, vehicle parking areas and on-base roadways. Listed in Table II \_ Ref. 11\_7 by geometric configuration are the non-aircraft sources encountered at most military air bases.

The environment which surrounds an air base must be accounted for in assessing air quality. "Environ" sources include all point, line and area sources which exist beyond the boundaries of the air base. Motor vehicle emissions are calculated from activity factors and may be specified as

TABLE I
NAVY LTO MODES

MODE OF OPERATION	SOURCE MODEL
Startup	Area
Taxi out	Line
Take off delay*	Area
Engine check	Area
Runway (take off) roll	Line
Climb (1+2)	Line
Approach IFR	Line
Approach VFR*	Line
Landing	Line
Taxi in	Line
(Hot + Pit) refuel delay*	Area
Hot refuel*	Area
Shutdown	Area
(Arrival + Departure) servicing	Area
Fuel venting	Area
Fill + spill	Area
TGO pattern*	Line
FCLP pattern*	Line
Pad work*	Line
Hover work*	Area
Autorotation pattern*	Line

<sup>\*</sup>Modification to AQAM

TABLE II

AIR BASE NON-AIRCRAFT EMISSION SOURCES
(from Ref. 11)

POINT	LINE	AREA
Training Fires	Military Vehicle	Fuel, Working
Test Cells	Civilian Vehicle	Fuel, Spillage
Runup Stands	Other	Fuel Breathing
Power Plants		- Storage Tanks
Incinerators		- Tank Trucks
Large Storage Tanks		- Auto Parking
Other		Other Hydrocarbons
		Space Heating
		Off-Road Vehicles
		Military Vehicle
		Civilian Vehicle

area or line sources. All other environ sources (point, area and line) require data input of actual annual emissions by pollutant type in addition to spatial configuration data. Land use factors may be used for an order of magnitude estimate of environ area source emissions [Ref. 6].

Since aircraft, air base and environ emissions are inventoried by the Source Inventory Program, this program acts as a comprehensive model for calculation of annual emissions and provides a qualitative ranking of the importance of each source to air quality. The Source Inventory Program also produces the data bank containing source characteristics, annual emission rates and temporal distribution activity which is utilized by the Short-term Program.

The Short-term Program "receives the compiled annual results of the Source Inventory Program and calculates the dispersion of generated pollutants during a given hour, day and month utilizing average meteorological conditions for that hour" \( \int \text{Ref. 10\_7.} \)

Most emissions which have zero plume rise are classified as area or line sources. Those sources which exhibit plume rise are classified as point sources. Point source emissions require an input data set of physical and geometric parameters to define a plume in three-dimensional space with the exception of large storage tanks and run-up stands which are modeled as point sources without a plume rise. In general, point sources with vertical exhaust emissions are modeled by a Holland or Carson-Moses plume rise and those with horizontal

exhaust or evaporative transport are modeled without a plume rise.

Plume definition requires the input of many parameters. For example, point source data specified for test cells consist of the X,Y coordinates of the source, stack height, stack exit gas temperature, stack exit gas velocity, stack diameter, building height, and initial and vertical dispersion parameters. Line and area sources require less source physical definition since these sources are modeled without a plume rise. Line sources are specified by the length of the line and the activity which occurs on the line. Area sources are specified by the X,Y coordinates of the center of the area, the length of a side and the activity which occurs in the area. "Transport and dispersion of pollutant emissions are modeled using a steady state Gaussian plume formulation" in both the horizontal and vertical directions. Point sources are treated by a "virtual source technique," whereas line sources are treated by "analytical integration over the length of the line" and area sources are treated as "pseudo point sources located upwind of the actual area source" [Ref. 6]7. The appropriate travel time or travel distance dispersion coefficients are used "to estimate lateral and vertical diffusion" and downwash rules are utilized to determine the effective emission height / Ref. 6.7. The dispersal of pollutants over a grid of receptors allows comparison of ambient pollutant concentrations to air quality standards.

#### III. ADAPTATION REQUIREMENTS

Military aviation differs considerably from commercial aviation in landing and departure evolutions. In addition, USN flight evolutions differ from USAF flight evolutions due to "the dissimilar operational landing facilities used by the two services" and the different training requirements imposed by the dissimilar missions of the two services. "A USAF aircraft always utilizes a runway or other prepared surface for takeoffs and landings, as opposed to Naval aviation's use of the comparatively small aircraft carrier"

Both the EPA's and USAF's LTO cycles confine all flight operations in one vertical plane \_Ref. 2, 8, and 9\_7.

Reference 10 stipulates that flight operations occur in a vertical plane only when Instrument Flight Rules (IFR) are in effect and that flight operations are best simulated by three-dimensional models when Visual Flight Rules (VFR) are in effect. Figures 1 and 2 depict IFR and VFR aircraft operations.

The three-dimensional LTO cycle required to adequately simulate VFR approaches, touch and go (TGO) training cycles and Field Carrier Landing Practice (FCLP) is developed in Ref. 10. The development of the three-dimensional LTO cycle provides more realistic estimates of the total emissions due to aircraft operations. In addition, for Navy operations,

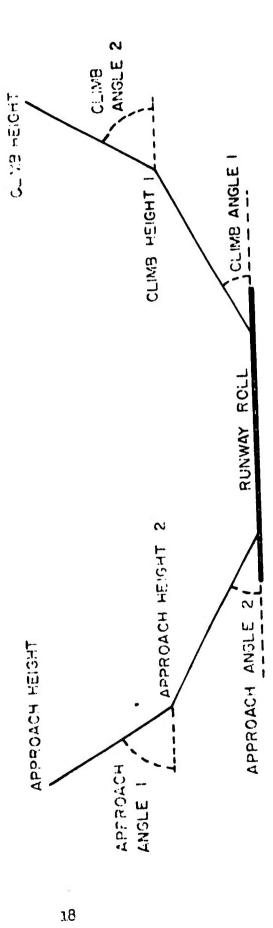
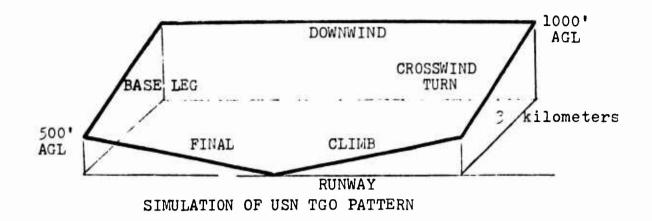
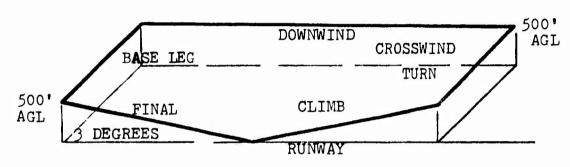
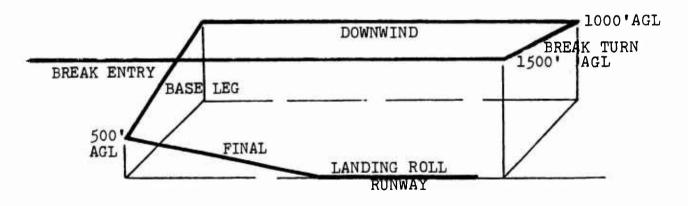


Figure 1. IFR APPROACH AND DEPARTURE





SIMULATION OF USN FCLP PATTERN



SIMULATION OF USN VFR BREAK ENTRY

FIGURE 2. VFR FLIGHT SIMULATIONS

it was required to expand AQAM to include autorotations and the off runway environment so that rotary wing aircraft operations could be simulated.

Many Naval Air Stations possess a large complement of rotary wing aircraft. These aircraft operate almost exclusively below 3000 feet while in the vicinity of the airfield. Rotary wing aircraft utilize the VFR, TGO and FCLP patterns described in Ref. 10, but at lower altitudes and speeds. Helicopters also operate in specified areas away from the runway environment. These areas are normally called "pads," and the training which occurs is referred to as "pad work" and "hover work." Since training "pads" are often utilized for fifty per cent of any helicopter operational cycle, the inclusion of "pad work" and "hover work" in both the Source Inventory Program and Short-term Program was necessary.

AQAM limited aircraft refueling from fuel trucks to the aircraft parking areas. Reference 10 extended AQAM to include "the pressure refueling of aircraft with their engines running," termed "hot refueling." This original modification was not consistent with the model format nor did it account for delays in entering the hot refuel area. Also, another type of refueling exists, termed "pit refueling." The latter procedure involves pressure refueling an aircraft after it has shutdown in a specified area (the pit) other than its normal parking area. The aircraft is then towed to its parking area after refueling. Therefore, servicing and

shutdown emissions must be accounted for in the pit area and account must be made for aircraft delays in entering the pit area.

Another aspect of aircraft operations, military or commercial, which should be included in any LTO cycle is the take-off delay which occurs at the end of the runway. This delay can be quite extensive as it involves pre-flight checks, IFR clearance changes, safe separation of aircraft, and formation flight join-up. This delay was not modeled in AQAM as it was not part of the EPA and USAF LTO cycles.

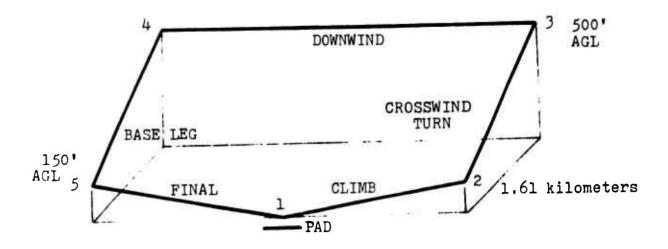
The requirements to change the aircraft related portions of AQAM were generated by the differences between commercial, USAF and USN aircraft operations. Due to special training requirements to ensure safe operations aboard ship, the USN developed a much larger LTO cycle which required three-dimensional models to simulate air operations. The models for non-aircraft activity were not changed since air base parameters are relatively consistent from base to base, and the environ parameters were flexible since the environment cannot be predicted a priori from base to base.

#### IV. ADAPTATIONS ACCOMPLISHED

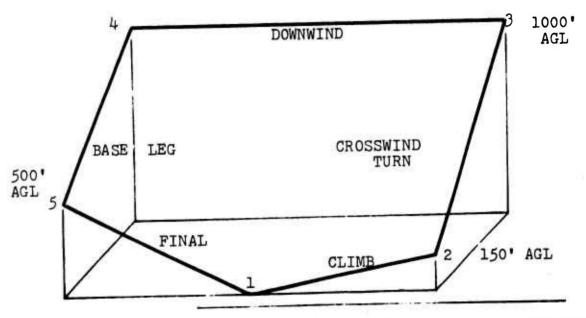
The initial modifications made to adapt AQAM to represent Naval air operations are described in Ref. 10. These modifications nulled level line sources that existed above the mixing depth, keyed calculations to aircraft operations on a runway, added hot refueling as an area source and expanded the LTO cycle from two to three dimensions by developing crosswind and downwind aircraft flight paths to simulate VFR approaches, TGO cycles and FCLP cycles.

Rotary wing aircraft operate in both a runway and off runway environment. The IFR, VFR, TGO and FCLP simulations described in Ref. 10 and depicted in Figures 1 and 2 adequately represent normal helicopter operations to a runway. However, pattern heights and lengths of crosswind legs are different for helicopters. One maneuver practiced by rotary wing pilots which is not represented by the latter simulations is the autorotation. An autorotation is the emergency procedure utilized to safely land a helicopter which has experienced a dual engine or tail rotor failure while in flight. Regulations require that this maneuver, when practiced, be conducted to a prepared surface (runway).

An autorotation pattern is depicted in Figure 3. The helicopter climbs to 150 feet (Point 2) from a hover (Point 1) over the runway. At Point 2 the aircraft commences a climbing crosswind turn to downwind entry (Point 3). If



SIMULATION OF USN HELICOPTER PAD WORK PATTERN



SIMULATION OF USN HELICOPTER AUTOROTATION PATTERN

FIGURE 3. HELICOPTER FLIGHT SIMULATIONS

the crosswind turn is completed prior to 1000 feet the climb is continued to 1000 feet. The downwind leg is flown at 1000 feet, paralleling the runway until abeam the point of intended landing. As soon as safe separation between aircraft can be established a descending turn is commenced toward the runway (Point 4 to Point 5). The autorotation is entered anytime between point 4 and point 5 by going from a normal power setting to an idle power setting. The final leg is entered at 500 feet with the nose of the aircraft lined up with the centerline of the runway. On final, a flare is executed to arrive at zero to low airspeed over the intended point of landing. This hover altitude is modeled as 20 feet, but actually varies with helicopter type. The entire pattern is flown at 70 knots. If the autorotation is performed at a speed other than 70 knots, this speed is attained while in the downwind leg.

In order to conduct extensive hover work for training purposes and to relieve the runway of congestion, helicopters often operate on pads which are adjacent to the runway. Flight patterns to and from these pads always parallel the flight pattern for the runway being utilized.

A pad work pattern is depicted in Figure 3. The helicopter climbs to 150 feet (Point 2) from a hover over the pad (Point 1). At Point 2 a climbing crosswind turn is commenced to enter (Point 3) the downwind leg parallel to the pad at 500 feet. The downwind leg is continued until abeam the pad. As soon as safe separation between aircraft can be established a descending turn from Point 4 to Point 5

is executed. The final phase of the approach commences at 150 feet (Point 5), with the nose of the helicopter lined up with the center line of the pad. The helicopter adjusts power, and flares as necessary to arrive over the pad at zero or low speed in a 10 feet hover. The hover altitude can vary with training requirements but is most often in the 5 to 20 feet range.

Hover work was modeled as an area source utilizing the X,Y coordinates of the pad and the length of the side of the operating area. Hover work involves a great deal of aircraft movement about all three axes; therefore, it is best modeled as an area rather than a point source. Helicopters must be timed by type while conducting hover work to establish an average time-in-mode hover. This time may then be used to determined total emissions and emission rates.

Modification of AQAM to accept "hot refueling" and "pit refueling" options plus their associated delays was desired since these evolutions can be varied for pollution control at air stations. The Source Inventory Program was modified to accept a hot refuel delay area source, a hot refuel area source, a pit delay area source and a pit refuel area source. Observation indicated that certain refuel areas were used exclusively by specific aircraft. Therefore, each aircraft type was tagged to indicate its normal refuel procedure.

Each refuel and delay operation was timed, and times in each area were assigned by aircraft type.

Another evolution which can be varied for pollution control is the take off delay at the end of the runway. This delay was incorporated into the LTO cycle for USN aircraft operations and was modeled in the same area as the engine check area source. Dwell times in this mode of operation were measured and assigned by aircraft type.

AQAM, when first received, used only JP4 fuel parameters to model jet fuel. Since the Navy utilizes JP5 fuel, the JP5 fuel parameters were added to the model in place of the JP4 parameters. Fuel parameters affect vapor pressure and are significant in determining hydrocarbon evaporative losses.

The Short-term Program was modified to accept level line sources at or above an inversion layer as null sources [Ref. 10\_7. This modification was extended to any line sources which existed entirely above an inversion layer, be they level or skewed lines.

The Short-term Program limited the number of grid receptors to 312. This number was insufficient to delineate the environ sources about the air station. Therefore, the number of grid receptors was increased to 412.

Since ADAM was developed for the USAF, it did not have a runway roll (take-off) equation for the F-14 aircraft. The following series of equations were developed for the

F-14 using the least squares procedures specified in Ref. 12.

(Dimensionless) TOF = 
$$(0.0001xT^2)+(0.0002xPA+0.0040)xT + (0.0001xPA^2+0.0181xPA+0.3100)$$

(ft) 
$$GR = (0.0121xGW-206.6421)xTOF + (0.0350xGW-3.106.3345)$$

- (ft) FGR = GR (0.0087xGR + 6.4583)xWS
- T is in degrees Fahrenheit.
- PA is in hundreds of feet.
- GW is in pounds.
- WS is in knots.

The take off factor (TOF) is calculated from the temperature (T) and pressure altitude (PA) which are specified in the meteorological data. Ground run (GR) is then calculated from the TOF and aircraft gross weight (GW), an LTO cycle input parameter. The final ground run (FGR) is calculated from the GR and the projection of the wind speed (WS) vector on the runway.

#### V. DATA ACQUISITION

NAS Miramar, California, was selected as the site for data collection for the high intensity air operations conducted, representative on-base facilities and off-base residential/industrial environment. NAS Miramar is one of the most active air stations in the United States. Total aircraft operations (arrivals + departures + TGOs + FCLPs) exceeded 200,000 for 1975. In addition the air station has a large fuel farm, many service and training facilities, much on-base vehicular traffic, engine test cells and base housing. Also, many environ emission sources exist in close proximity to NAS Miramar. Three major highways border the air station to the east, north and southwest. Industrial sites are north and south and residential areas lie to the north, southeast and southwest of the air station. This interplay of aircraft, air base facilities and off air base environment is indicative of many commercial and military airfields today and is the reason the contribution of each source to air quality must be determined. Tables I and III through VI depict the sources analyzed at NAS Miramar.

The initial collection of data at NAS Miramar provided a data base for aircraft operating parameters and meteorological parameters \_Ref. 10\_7. This data base was the

TABLE III
POINT SOURCES AT NAS MIRAMAR

SOURCE	BLDG. NO.
TRAINING FIRES	к118
TEST CELLS	545
	463
	462
	542
	565
RUN UP STANDS	589
	419
POWER PLANT	K212
STORAGE TANKS	935
	940
	936
	319
	483
	K230

TABLE IV

AREA SOURCES AT NAS MIRAMAR

SOURCE	LOCATION
FUEL WORKING	K231 K234 K229 M319 K214 498
FUEL STORAGE	FUEL TANK FARM TEST CELL FUEL TANKS QUALITY CONTROL TANK
TANK TRUCK PARKING	NEAR 592 NEAR K229
VEHICLE PARKING	TEN AREA SOURCES INCORPORATE ALL BASE PROPER PARKING BETWEEN THE FLIGHT LINE AND NORTH GATE.
SPACE HEATING	BASE HOUSING MOBILE HOMES PROPANE USERS
GROUND MOBILE*	SAME AREAS AS VEHICLE PARKING AND SPACE HEATING.

<sup>\*</sup>VEHICULAR EMISSIONS WHICH OCCUR WHILE TRAVELING TO OR FROM A MAJOR ROADWAY (LINE SOURCE) ARE CONSIDERED AREA SOURCES.

#### TABLE V

### LINE SOURCES AT NAS MIRAMAR

#### ROADWAY

MIRAMAR WAY

POLARIS AVENUE

MITSCHER WAY

JUPITER ROAD

RIGEL AVENUE

REGULUS AVENUE

RAVEN ROAD (PORTION PARALLEL TO FLIGHT LINE)

#### TABLE VI

#### ENVIRON SOURCES SURROUNDING NAS MIRAMAR

#### ROADWAYS

INTERSTATE 805

HIGHWAY 15

MIRAMAR ROAD

## RESIDENTIAL AREAS\*

#### INDUSTRIAL AREAS\*

<sup>\*</sup>RESIDENTIAL AND INDUSTRIAL SOURCES WERE MODELED USING LAND USE FACTORS SINCE A DATA BASE WAS NOT ESTABLISHED FOR THESE SOURCES.

result of an existing twenty-five year history of meteorological data and over eighty hours of observations of aircraft operations. These observations provided definition of taxi paths, parking areas, dwell time in various operating modes, and recognition of the need for a three-dimensional LTO cycle to adequately assess the contribution to air quality of Naval aircraft operations.

Later collections of data focused on the air station and the surrounding environment. Over sixty hours of data collection provided a sound data base for the air station. An adequate data base for the environment bordering NAS Miramar was not established except for the major highways bordering the air station.

Data were collected from existing records, by interviews and by observation. An extensive amount of raw data must be collected to describe each source. AQAM estimates of air quality are probably more dependent on the data input to the model than on any limitations to the simulations used to describe dispersion and operations \_Ref. 6\_7. Since every air station is physically different, and possesses different aircraft and surroundings, a complete data survey is required to satisfy the input data requirements for each source.

#### VI. RESULTS AND DISCUSSION

Once modified, the Source Inventory Program and the Short-term Program provided an ambient air quality model for assessment of U.S. Naval aviation emittants. The model was utilized to conduct seven simulations of operations at NAS Miramar. These simulations are summarized in Table VII and permitted a parametric analysis of the relationships between the broad categories of aircraft, air base and environ sources. Finally, using the total sources, an attempt was made to distinguish the subtle interplay of the primary source categories to the overall ambient air quality about NAS Miramar.

The meteorological and temporal parameters were held constant for each case. These parameters are tabulated in Table VIII.

Case 1 was established as the base case and represented operations as they are normally conducted at NAS Miramar. Changes to the source parameters of Case 1 constituted the remaining cases. Case 2 provided a better estimate of the emissions from sources surrounding NAS Miramar. Land use factors were used to provide an order of magnitude estimate \( \subseteq \text{Ref. 6\_7} \) of these environ sources, since better data were not available. Case 3 removed the take off delay, pit refuel delay, hot refuel delay, pit refuel and hot refuel

# TABLE VII SIMULATIONS OF OPERATIONS AT NAS MIRAMAR

CASE	DESCRIPTION
1	BASE CASE. INCLUDES ALL AIRCRAFT SOURCES, AIR BASE SOURCES AND HIGHWAY TRAFFIC ADJACENT TO THE AIR BASE.
2	BASE CASE PLUS LAND USE FACTORS TO MODEL RESIDENTIAL/INDUSTRIAL ENVIRON SOURCES.
3	BASE CASE MINUS TAKE OFF DELAY, PIT REFUEL DELAY, HOT REFUEL DELAY, PIT REFUEL AND HOT REFUEL EMISSIONS.
4	BASE CASE EXCEPT TEST CELLS AND RUN UP STANDS EMITTING A FULL DAYS POLLUTION IN ONE HOUR, AIR BASE SOURCES ZEROED.
5	BASE CASE MINUS ENGINE TEST CELLS AND RUN UP STANDS.
6	BASE CASE PLUS HYDROCARBON WORKING LOSSES.
7	BASE CASE MINUS TAKE OFF DELAY, PIT REFUEL DELAY AND HOT REFUEL DELAY SOURCES.

### TABLE VIII

## METEOROLOGICAL AND TEMPORAL DATA

## METEOROLOGICAL PARAMETERS

TEMPERATURE (DEGREES FAHRENHEIT)	65.0
MIXING DEPTH (METERS)	800.0
WIND DIRECTION (DEGREES)	200.0
WIND SPEED (METERS/SECOND)	2.57
STABILITY CATEGORY	2

## TEMPORAL DATA

YEAR						1975
MONTH						MAY
PERIOD	1200-1300	HOURS	ON	A	WEEKDAY	
HOUR INI	DEX					13

emissions. This procedure placed all refueling and servicing emissions in the aircraft parking areas, which was consistent with the original AQAM. Case 4 was a "worst case" study of the emissions from engine test cells and run up stands. As an approximation, the emissions for the entire day from each test cell/run-up stand were considered to be released in the hour under consideration. This corresponded to emissions from approximately eight minutes of operation for each run-up stand and eighty minutes of operation for each test cell. All other air base sources had zero emissions. Case 5 established the pollution caused by the air base without the engine test cells and run up stands in operation. Case 6 established the hydrocarbon working losses that would occur if vapor recovery systems were not utilized by NAS Miramar. Case 7 removed the take-off delay, pit refuel delay and hot refuel delay sources to study the effects of aircraft delays on ambient air quality.

The Source Inventory Program provides a summary of the annual emissions by source. This summary is presented in Tables IX through XI for Case 1. In addition, the effect of the environ sources when land use factors are added is depicted in Table XII. The parameters which define each case can be interpreted from these tables. Source Inventory summaries can only be used to establish the qualitative importance of a source to ambient air quality since the emissions have not been dispersed in time and space.

TABLE IX

CASE 1 - SUMMARY OF AIRCRAFT SOURCE EMISSIONS

SUMMARY OF ANNUAL EMISSIONS IN AIRCRAFT LTO MODES ALL POLLUTANTS IN METRIC TONS

				·	
OPERATION	잉	HC	NOX	PM	SOX
STARTUP	8.979E 01	3.627E 01	4.623E 00	4.136E 01	52E-0
TAKEOFF DIV	610E 0	.768E 0	. 536E 0	・	.729E-0
ENGINE CHECK	.548E 0	.149E-0	.100E 0	.421E 0	10
	·648E 0	.023E 0	·764E C	.246E 0	.681E-0
CLIMB (1+2)	.180E 0	.056E 0	.454E 0	.059E 0	.383E-0
	.40IE 0	.161E 0	.325E 0	.160E 0	.650E-0
APPROACH VFR	.325E 0	.332E 0	.107E 0	.57LE 0	.198E-0
LANDING	.628E 0	.880E 0	.482E 0	.236E 0	.600E-0
	.242E 0	.558E 0	.35年 0	.29LE 0	.059E-0
(HR+PIT) DLY	.527E 0	.383E 0	.756E 0	.959E 0	0
HOT REFUEL	.634E 0	.198E 0	.678E 0	.846E 0	•
SHUTDOWN	.918E 0	.331E 0	.100E 0	.021E 0	•
ARR + DEP SV	.399E 0	.626E 0	.142E 0	0.	0.
FUEL VENTING	0	0	•	•	•
FILL + SPILL	0.	.762E-0	•	•	•
TGO PATTERN	.45	•	.494臣	.294E 0	•
FCLP PATTERN	.793医 0	.256E 0	.106E 0	.45	•
PAD WORK	0	0	•	0.	•
HOVER WORK	•	•	•	•	•
AUTOROTATION	•	•	•		•
TOTAL	2.638E 03	9.511E 02	7.367E 02	2.339E 03	1.475E 00

TABLE X

CASE 1 - SUMMARY OF AIR BASE SOURCE EMISSIONS

## SUMMARY OF ANNUAL EMISSIONS FROM AIR BASE FACILITIES ALL POLLUTANTS IN METRIC TONS

	OPERATION	잉	H	NOX	M	SOX
	TRAIN FIRES	2.096E 01	1.198E 01	1.553E-01	4.791E 00	0.0
	TEST CELLS	1.587E 02	1.768E 01	1.094E 02	1.45SE 02	0.0
	RUN-UP STDS	4.799E-01	1.869E-01	4.587E-01	8.019E 00	3.893E-02
	POWER PLANTS	5.120E-04	5.120E-02	2.248E-01	2.320E-02	7.680E-04
	INCINERATORS	0.0	0.0	0.0	0.0	0.0
	OTHER AB PTS	0.0	0.0	0.0	0.0	0.0
	SPACE HEATING	2.880E-03	1.152E-03	1.765E-01	2.718E-03	8.640E-05
	TOTAL	1.802E 02	2.990E 01	1.104E 02	1.584E 02	3.978E-02
3 k	S	SUMMARY OF ANN	UAL EMISSIONS ALL LOSSES	FROM EVAPORATI IN METRIC TONS	RY OF ANNUAL EMISSIONS FROM EVAPORATIVE HYDROCARBONS ALL LOSSES IN METRIC TONS	Ø

OTHER 0.0 SPILLAGE 0.0 FLOATING ROOF BREATHING LOSS 0.0 0.0 FIXED ROOF BREATHING LOSS 3.280E 00 6.175E-01 5.291E 01 9.762E-01 WORKING LOSS 6.418E 00 PET. STOR.TKS TNK. TRUCK PK VEH. PARKING OTHERS STORAGE TANKS OPERATION FILLING

TOTAL EMISSIONS FROM EVAPORTIVE HYDROCARBONS IS 6.420E O1 METRIC TONS

TABLE X (CONTINUED)

SUMMARY OF ANNUAL EMISSIONS FROM GROUND MOBILE SOURCES

Ď		AL	I POLLUTANTS	ALL POLLUTANTS IN METRIC TONS		
OPERATION	00		HC	NOX	M	SOX
OFF ROAD VEH	1.526E	00	2.307E-01	2.759E 00	4.838E-02	9.677E-02
CIVILIAN VEH	1.833E	01	1.703E 00	1.340E 00	2.333E-01	8.045E-02
CIV.VEH. LINE OTHER ABLINE	3.293E 02 0.0	02	3.585E 01 0.0	6.007E 01 0.0	8.320E 00 0.0	2.869E 00 0.0
TOTAL	3.491E 02	02	3.778E 01	6.416E 01	8.602E 00	3.046E 00

TABLE XI

CASE 1 - SUMMARY OF ENVIRON AND TOTAL SOURCE EMISSIONS

## SUMMARY OF ANNUAL EMISSIONS FROM ENVIRONS ALL POLLUTANTS IN METRIC TONS

SOX	0.0 0.0 0.0 0.0 6.33E 01	6.333E 01		SOX	1.475E 00 3.046E 00 3.978E-02 6.333E 01	6.789E 01
æ	0.0 0.0 0.0 0.0 1.837E 02	1.837E 02	SNS	<b>P</b>	2.339E 03 8.602E 00 1.584E 02 1.837E 02	2.690E 03
NOX	5.190E 00 0.0 0.0 0.0 1.616E 03	1.621E 03	ANNUAL EMISSIONS IN METRIC TONS	NOX	7.367E 02 6.416E 01 1.104E 02 1.621E 03	2.533E 03
윘	2.000E-01 0.0 0.0 0.0 5.804E 02	5.806E 02	SUMMARY OF ALL ALL POLLUTANTS	위	9.511E 02 3.778E 01 9.410E 01 5.806E 02	1.664E 03
잉	1.376E 01 0.0 0.0 0.0 4.850E 03	4.864E 03	01 <b>4</b>	임	2.638E 03 3.491E 02 1.802E 02 4.864E 03	8.032E 03
OPERATION	ENVIRON PTS. ENV STA AREA ENV MOB AREA ENV LAND USE ENV COM AREA ENV ROAD WAY	TOTAL		OPERATION	AIRCRAFT GROUND MOBIL FACILITIES ENVIRONS	GRANT TOTAL

TABLE XI (CONTINUED)

PERCENT OF EMISSIONS FROM ALL SOURCES

OPERATION CO AIRCRAFT 32.848	HC 57.171	NOX 29.089	PM 86.964	SOX 2.173
4.347	2.271	2.533	0.320	7. 7
2.243	5.657	4.358	5,888	0.05
195	106.46	64.020	6.829	93.28

TABLE XII

CASE 2 - SUMMARY OF ENVIRON AND TOTAL SOURCE EMISSIONS

OPERATION ENVIRON PTS.	<u>co</u> 1.376E ol	HC 2.000E-01	NOX 5.190E 00	AL O	SOX 0.0
ENV STA AREA ENV MOB AREA ENV LAND USE ENV COM AREA ENV ROAD WAY ENV NON-ROAD	0.0 0.0 9.278E 04 0.0 4.850E 03	0.0 0.0 1.792E 04 0.0 5.804E 02	0.0 0.0 7.215E 03 0.0 1.616E 03 0.0	0.0 0.0 3.024E 03 0.0 1.837E 02 0.0	0.0 0.0 3.864E 03 0.0 6.333E 01
TOTAL	9.764E 04	1.850E 04 SUMMARY OF ALL	8.836E 03 ANNUAL EMISSIONS TH METRIC TONS	3.207E 03	3.927 <b>E</b> 03
OPERATION	00	汨	XON	FW.	SOX
AIRCRAFT GROUND MOBIL FACILITIES ENVIRONS	2.638E 03 3.491E 02 1.802E 02 9.764E 04	9.511E 02 3.778E 01 9.410E 01 1.850E 04	7.367E 02 6.416E 01 1.104E 02 8.836E 03	2.33% 03 8.602E 00 1.584E 02 3.207E 03	1.475E 00 3.046E 00 3.978E-02 3.927E 03
GRAND TOTAL	1.008E 05	1.958E 04	9.747E 03	5.713E 03	3.932E 03

TABLE XII (CONTINUED)

PERCENT OF EMISSIONS FROM ALL SOURCES

SOX	0.038 0.077 0.001 99.884
WA	40.939 0.151 2.772 56.138
NOX	7.558 0.658 1.132 90.651
HC	4.856 0.193 0.481 94.470
잉	2.617 0.346 0.179 96.858
OPERATION	AIRCRAFT GROUND MOBIL FACILITIES ENVIRONS

The Short-term Program takes the source data, emission strengths, meteorological data and temporal data and disperses the source emissions in time and space. These concentrations, which are collected over the receptor grid system, determine a sources contribution to ambient air quality.

Table XIII compares the maximum 1-hour receptor concentration from aircraft sources at NAS Miramar. For the receptor locations employed, removing aircraft delays (Case 7) reduced the maximum pollutant concentrations by only 2 per cent. However, Table IX shows that elimination of aircraft delays can reduce CO and HC yearly emissions by approximately 21 per cent and particulates by approximately 13 per cent. Case 3 eliminates the aircraft delays and puts all refueling in the parking areas. The maximum hourly concentrations occurred at the same receptor location (12, 9) as for Cases 1 and 7, but increased by approximately 17 per cent. This higher concentration results from receptor (12, 9) being located nearer to the parking area than to the hot refueling or pit refueling areas. Comparison of Cases 1, 3, and 7 shows that refueling in the parking areas increases the local ambient air concentrations of each pollutant in the parking area but decreases annual emissions of each pollutant by approximately 8 per cent. Locations of pertinent receptors are presented in Figure 4.

Table XIV compares the maximum 1-hour receptor concentration from <u>air base sources</u> at NAS Miramar. Case 1 and Case 5,

TABLE XIII

MAXIMUM 1-HOUR RECEPTOR CONCENTRATION (CHI) FROM AIRCRAFT SOURCES AT NAS MIRAMAR

POLLUTANT			CASE 1	73	CASE 3		70	CASE 7	
	(km)	Y (km)	Y CHI (km) (µg/m <sup>3</sup> )	X (km)	Y (km)	CHI (µg/m <sup>3</sup> )	X (km)	Y (km)	CHI (µg/m <sup>3</sup> )
CARBON MONOXIDE	12.0	0.6	214.8	12.0 9.0	0.6	250.2	12.0 9.0	0.6	213.2
HYDROCARBONS	12.0	0.6	80.99	12.0	0.6	95.03	12.0	0.6	19.64
OXIDES OF NITROGEN	12.0	0.6	17.77	12.0	0.6	18.87	12.0	0.6	17.71
PARTICULATES	12.0	0.6	125.1	12.0	0.6	126.3	12.0	0.6	124.8
OXIDES OF SULFUR	12.0	0.6	9.0 0.04087	12.0	0.6	0.04087	12.0	0.6	0.04087

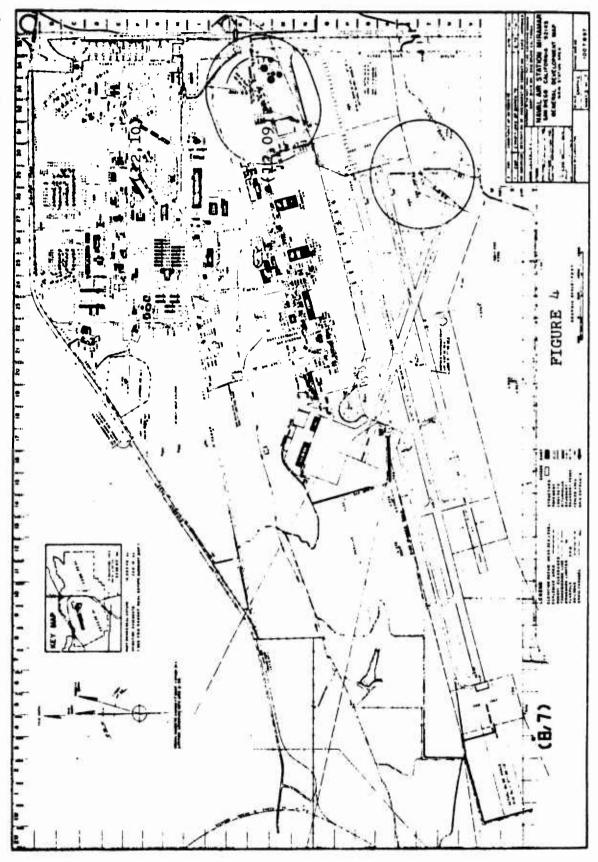


TABLE XIV

MAXIMUM 1-HOUR RECEPTOR CONCENTRATION (CHI) FROM AIR BASE SOURCES AT NAS MIRAMAR

	H; (m)	-67	0	36	,03	1713
9	(KE)	4.1	11.3	2.6	3.7	0.0
CASE 6	Y (km)	13.0 11.0 4.167	12.0 10.0 11.30	13.0 11.0 2.636	13.0 11.0 3.703	12.0 10.0 0.01713
	X (km)	13.0	12.0	13.0	13.0	12.0
CASE 5	CHI ( <b>M</b> E/m <sup>3</sup> )	12.0 10.0 1.177	12.0 10.0 8.580	12.0 10.0 0.4027	12.0 10.0 0.01711	12.0 10.0 0.01566
CAS	Х (кm)	10.0	10.0	10.0	10.0	10.0
	X (km)	12.0	12.0	12.0	12.0	12.0
CASE 4	$(km)$ $(km)$ $(\mu g/m^3)$ $(km)$	13.0 11.0 44.29	.0 11.0 4.985	12.0 11.0 30.39	.0 11.0 44.37	.0 11.0 0.02135
CAS	Y (km)	11.0	11.0	11.0	11.0	11.0
	X (km)	13.0	13.0	12.0	13.0	13.0
CASE 1	$(km)$ $(km)$ $(km)$ $(\mu g/m^3)$	13.0 11.0 4.167	12.0 10.0 8.668	13.0 11.0 2.636	13.0 11.0 3.703	12.0 10.0 0.01713
CA	Y (km)	11.0	10.0	11.0	11.0	10.0
	X (km)	13.0	12.0	13.0	13.0	12.0
POLLUTANT		CARBON MONOXIDE	HYDRO- CARBONS	OXIDES OF A NITROGEN	PARTICU- LATES	OXIDES OF SULFUR

together, indicate that the maximum local ambient concentrations (from air base sources) of carbon monoxide, oxides of nitrogen and particulates result, for this particular time period, from the engine test cells and run up stands. Source Inventory for these two cases also shows that test cell/run up stand operation contributes 30%, 14%, 63%, and 92% of the annual air base emissions of CO, HC, NOX and particulates, respectively. However, these values (when compared to the standards depicted in Table XV) indicate that test cells and run up stands by themselves produce less than one per cent of the 1-hour ambient air quality standards. The "worst case" (Case 4) values for engine test cells and run up stands are less than 7 per cent of the 1-hour ambient air quality standards.

Case 1 and Case 6, together, depict the reduction in hydrocarbon emissions which result from the recent installation of vapor recovery systems at NAS Miramar. These systems caused a 30 per cent reduction in both the maximum receptor concentration and yearly total emissions of air base evaporative hydrocarbons.

Table XVI compares the maximum 1-hour receptor concentration from environ sources surrounding NAS Miramar. Case 1 included the vehicular traffic emissions on Interstate 805, Highway 15 and Miramar Road. A sound data base exists for these sources. Case 2 included these emissions plus the emissions due to industrial and residential activity based on Land Use factors. Reference 6 cautions that the Land Use

TABLE XV

AMBIENT AIR QUALITY STANDARDS
(From Ref. 13)

POLLUTANT	STAI µe,	NDARDS /m <sup>3</sup>	
	California	Federal Primary	
CARBON MONOXIDE	46,000 <sup>1</sup>	40,0001	
OXIDES OF NITROGEN	470 <sup>1</sup>	1004	
HYDROCARPONS	NONE	160 <sup>2</sup>	
PARTICULATES	1003	260 <sup>3</sup>	
OXIDES OF SULFUR	1,310 <sup>1</sup>	365 <sup>3</sup>	

- 1-hour concentration not to be exceeded more than once per year.
- 3-hour concentration not to be exceeded more than once per year.
- 3. 24-hour concentration not to be exceeded more than once per year.
- 4. Annual arithmetric mean.

TABLE XVI

MAXIMUM 1-HOUR RECEPTOR CONCENTRATION (CHI) FROM ENVIRON SOURCES NEAR NAS MIRAMAR

POLLUTANT		CASE 1	B 1	:	CASE	E 2	
	X (km)	Y (km)	CHI (µg/m³)	X (km)	Y (km)	CHI (µg/m <sup>3</sup> )	
CARBON MONOXIDE	13.0	13.0 13.0	8.507	11.0	5.0	650.7	
HYDROCARBONS	10.0	12.0	1.081E-03	0.11	3.0	202.2	
OXIDES OF NITROGEN	10.0	12.0	2.806E-02	11.0	3.0	56.35	
PARTICULATES	13.0	13.0	1.855E-04	11.0	3.0	49.10	
CYIDES OF SULFUR	13.0	13.0	8.746E-06	11.0	5.0	59.63	

factors utilized to define environ activity can provide only an order of magnitude estimate of the actual concentration of pollutants. Therefore, the results for Case 2 in Table XVI may not be accurate and should be used with caution.

Table XVII presents data from <u>all sources</u> for cases 1 and 2. Again, the unreliability of the Land Use factors to accurately describe the environ sources prevents an accurate estimation of the interplay between aircraft and air base sources with the environ sources. The Table does indicate that aircraft sources dominate the maximum pollutant concentration's on the air base and dominate the maximum concentration of particulates throughout the receptor grid system. More data are required to define the environment prior to establishing the interplay of the three emission sources.

To permit analysis of more than just those receptors with maximum pollutant concentrations the entire receptor grid system for each primary source category is presented as Appendix A for Case 2.

TABLE XVII

MAXIMUM 1-HOUR RECEPTOR CONCENTRATION (CHI) FROM TOTAL\*
SJURCES ABOUT NAS MIRAMAR

	) )					
Pollutait		CA	CASE 1		CAS	CASE 2
	X (km)	Y (km)	CHI (µg/m³)	X (km)	Y (km)	CHI (µg/m³)
CARBON MONOXIDE	12.0 9.0	0.6	215.2	11.0	5.0	650.8
HYDROCARBONS	12.0	0.6	81.37	11.0	3.0	202.2
OXIDES OF NITROGEN	12.0	0.6	17.79	11.0	3.0	56.35
PARTICULATES	12.0	0.6	125.1	12.0	0.6	129.5
OXIDES OF SULFUR	12.0	10.0	0.05178	11.0	5.0	59.63

\*AIRCRAFT + AIR BASE + ENVIRONS

## VII. CONCLUSIONS AND RECOMMENDATIONS

Modifications to AQAM have enhanced the accuracy for predictions related to U.S. Naval Aircraft operations. The capacity of the air quality model to qualitatively relate the various emission sources exists at this stage in the model's development. The capacity of the model to quantitatively predict the ambient air quality through space and time must yet be verified by actual measurement.

The model can assist in the verification process. For a given set of meteorological data and temporal distributions the model can indicate the best receptor locations for optimizing data collection devices. Using the meteorological and temporal parameters of Table VIII and Cases 1 through 7, the best locations for receptors appear to be just south of the jet engine maintenance shop, just north of toyland and just north of the Miramar Road/Highway 15 intersection.

mefore the interplay of aircraft, air base and environ emissions can be established at NAS Miramar a data base for the environ sources must be established. In addition, the data base for the aircraft and air base sources must be updated to represent 1976. Recurring updates of any data base must occur or the quantitative results of the model will not represent the actual situation.

The model should be modified to provide contour mapping of pollutant concentrations over the grid of receptors.

Parametric studies conducted under differing meteorological and temporal distributions could then be visualized to indicate sources of high, medium and low concentrations. Then, parametric studies could be conducted by varying operational factors and source parameters to establish the combination which would provide the lowest pollution level.

APPENDIX A - AIRCRAFT, AIR BASE, ENVIRON AND TOTAL GRID RECEPTOR CONCENTRATIONS FOR CASE 2

NAS PIRAPIF FERICE . 1200 TC 1300 HOURS ON A WEEKDAY

PENTH - PAY

ECEFTOR CONCENT	F LCCATION I	× × × × × × × × × × × × × × × × × × ×	000		2000		000		000		# W P P P P P P P P P P P P P P P P P P	000 000 000	200	000 000 000
RATION DA		00	000	232E-021	243 243 259 259 259 259 259 259 259 259 259 259	027E 482E 809E 0	36.2E 55.4E 6.56E 0	402E 0	969E-06	950E 01 434E 01 828E 01	855E 01 777E 91 752E 91		2 5 8 E 00 I	750E-05
TA FROM ENV	EXPECT	F)	000	900-	600 600 600 600 600 600 600	2.578E 2.616E 000	4000 1000	4-240E-01		6.972E 00 1.312E 01 1.205E 01	6-6-3-3-6-0-1 6-6-3-3-6-0-1 6-2-3-6-0-1	1.368E 0.055E 0.055E	1.00EE 00 9.260E-01	0.0 0.0 0.0 -6.578E-06
IRON SCLECES	EC ARITHETIC	GRAMS/CL. M	000	2.641E-C	744E-	10000 10000	8424 8424 8424 8426 8426 8426 8426 8426	1-732E-C1 0-0	-3.005E-C7	2-84EE CO 4-921E CO	2-7-21E 2-7-43E 2-7-05E C0	8-917E-01-	4-117E-61	0.0 0.0 -2.635E-CE
	P. F. B.N.	ETER) PT	990		-3-21-6-05 -5-00-76-05 -6-02-6-01	2.036E-C1	5-106E-02	0.0 0.0		5.557E-01 1.128E-00 1.036E-00	7-256E-01		0.0546-02 0.0556-02	-1.655E-CE
	 	305	000	1-0	ישונים	12.00 12.00 12.00 12.00 12.00 12.00 13.00 10.00		4-367E-02		1.24:00 1.24:00 1.24:00 00 00 00 00	104	1244 1444 1444 1404 1404 1404 1404 1404	44-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-	-100 -100 -100 -100 -100

PENTH = PAY FERICE = 1200 TO 1200 HOURS ON A WEEKDAY

		ECEFTOR CON	CENTRATICN CA	ITA FROM ENVI	PON SCLECES		
FECETOR AUPREF	RECEPTOR	LCCATICA		EXPECTE	EC ARITHETIC	HEAN	
	KELCPE	TEFS)	8	FICE	GRAMS/CL. P	TEP) FT	\$C2
W.C.	90	800 800 800	364E-0	352E-0	1.9346-68	105E-0	6.00 2.1256-03
444 Owl/	000	000	1-050E 02 9-175E 01	613E	7-25 6-51 6-51 6-51 6-61 6-61 6-61 6-61 6-6	24.0 24.0 24.0 24.0 200	004
444 61470	500 500	000	5.510E 01 1.437E 01	3-843E 000 2-536E 000			2002 0002 0002 111
444	000	500	1.218E 01 9.824E 01	000 000 000 000 000 000 000 000	1111	200	752
4NIU	990 900	900	.002E-0	2665	0.0 -2.273E-C5	-SSE-0	8E-0
ושושו	000	000	2.355 1.10011 1.1006 1.000	9406-0	3756-6	UNUNN.	1 -44
8140E	one one	000	527E 02 565E 02 534E 02		H31 8	4000 MMM	000 000 000 000
1010.0 1010.0	000 000 000	000		000 000 000	1.037E S1		200 000 000 000 000
	000 000	500	-273E -996E -766E		1:219	8/00- 00-4 000-	44W)
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-	FECEFICE I		നലന വ	והטטוח	444	777	222	WWu) 44101	414141	RIMINI	ו היאשו	######################################	9	404	370

PCRTH = PAY FERICE = 1200 TC 1300 HOURS ON A WEEKDAY

-		PECEFTOR CONC	CCNCENTRATICN CA	CATA FROM ENV	ENVIRON SCUFCE	S	
FECEFICA	PECEFTCF	LCCATION		EXPECTED	EC ARITHETIC	7 E	0 0 1 0 1 0 0 0 0 0
	KILCH	ETERS)	03	I FCMICR	GRAMS/CU. P	ETER) FT	203
37	22.00	3.00	7.243E-03	-2.404E-0E	-1.00EE-CE	-2.215E-05	1.352E-05
נוטוע נולבו נולבו	4.14.14.1	6.50 000 000	80°	2.786E-02 4.301E-01 6.125E-01	5-5	4-270E-04 3-64E-02 5-537E-02	4-276E-04 4-210E-05 6-160E-02
2100c) 210cc 210cc	23.00 23.00 25.00	7.00 6.00 6.00	\$27E 0		3-905E-01		5 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 -
6000 7000 7000		1110000	1 -250E 01 1 -480E 01 311E 01		8-840E-61 1-052E-60 9-443E-01	2 - 62 FE - 01 2 - 85 7E - 01	2.737E-01 2.565E-01
1111111 111111111111111111111111111111		113.000	1.451E 01 1.624E 01		9-887E-C1 1-085E-C1 1-23CE C0	23-13-0 -3-13-	2.255E-01 2.875E-01 4.750E-01
#140 #80 #80 #140 #140 #140 #140 #140 #140 #140 #14		2.00		0.0 -6.444E-11 1.048E-05	-2-702E-11	-7-276E-12	-7-276E-12 -7-276E-12
616161 41807 4007	24.00 24.00 24.00	6.4.2 000 000	.212 .212 .229		1.88EE-C5 8.552E-C4 4.412E-C3		2.088E-04 1.088E-04
1000 1000 1000	444 000	2000	1.4.284E-01 1.470E 00 2.941E 00	2.516-02 5.0316-01	3.036E-C2 11.035E-C1 2.079E-C1	6 - 10 2 E - 0 3 5 - 4 10 E - 0 2 5 - 4 10 E - 0 2 5 5 E - 0 2 5 E	7 - 4 2 3 E - 0 2 E - 6 2 E -
4814	200 200 200	2000 0000 0000	4-794E 00 6-858E 00 8-956E 00	8-207E-01 1-178E 00 1-545E 00	4.9366-61	10. 10. 10. 10. 10. 10. 10. 10. 10. 10.	9-4-8-6-01 1-4-2-6-01 1-5-3-7-6-01
C10101	000	2274			6-436E-01 7-290E-01 8-297E-01	2.12.E-01 2.614E-01	1.0896-01 2.2366-01 2.7366-01
1 400	24.00	15.00	1 1.273E 01	1 2.415E 00	1 9.485E-01	1 3-234E-01	3.2536-01

PENTH = PAY FERICE - 1200 TO 1300 HOURS ON A WEEKDAY

		205	000	000	<b>9</b> 00	000	900	000	000	900	900 900	000	900	900	0.0
S	CFEAN	ETER! FT	990	000	000	000	000 000	000	000 000	900	000	990	000	000	0.0
CAT SCUFCE	C ARITEPET	GRAMS/CL. P	000	000	000	000	000	000	000	900	000	000	000	000	0.0
TA FROM AIRE	EXPECTED	HC HICH	000	900	000	000	000	000	000	900	000	000	000	900	0.0
ENTRATICH CA		00	000	000	000	000	000	000	000	000	000	000	000	000	0.0
CEFTCR CONC	LCCATION	IEFS)	900	600 000	900		0000	8/0 0 0 0	000 000	000 000 000	10000	000	4//0 000	000	00.4
<b>C</b> .	RECEFTCF	XXICE	000 000	000	000	000	000	000	990	000	000	000	000	000	2.00
	NECE THE PERSON NAMED IN PERSO		-cun	46.40	~ w	0-12	01445 		501		256	2776		West Arim	37

FROM DIRPORT SCLECES
EXPECTED ARITHMETIC PEAN | DOC 00 000 000 000 000 000 000 000 000 000 000 000 000 L CHICKE 00 000 000 000 000 000 000 000 000 000 000 000 CCNCENTRATICA 1300 HOURS 80 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 8 80 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 80 FECE FICE HUNDH

67

PENTH - PEY FERICE - 1200 TO 1300 HOURS ON A MEEKCAY

: ————————————————————————————————————	1 1 1 1 1 1 1 1 1 1 1	1 562	10	000	000	000	900	000	900	000	300	999	900	000	000
	FER	ETER) FT	0.0	000	000	900	900	900	900	900	900	000	000	000	800
CRT SCUFCE	EXPECTED ARITHMETIC	GRAMS/CL. P	0.0	000	000	000	000	000	000	000	000	000	000	000	000
TA FROM PIRE		HCRC HCRC	0.0	000	000	000	000	000	000	000	000	000	000	000	000
ENTRATICA CA		1 00	0.0	000	000	000	000	000	000	000	000	000	000	000	000
ECEPTOR CONCE	LECATION	EFS)	10.00	000	400 000 000	000	441A 000	000 000	000	000	000	000 000	900 900	000	000
•	RECEPTOR L	XXICAE	4.00	444 000 000	44m,	000	990 990 990	000 000	900 900 900	900 900 000	000	000	000	000	000
	FECEFICA		32	AL-80	A00	2404 2404 1	11-11-1 11-11-1	20 00 U		4814	A.M.Q.	0-11V	000 014*1	900 900 900	V9-1

PENTE - PEY FERICE - 1200 TO 1200 HOURS ON A WEEKDAY

		ECEFICA CONC	ENTRATION CA	TA FACP AIF	CRT SCUFCES		
FECEFACE I	RECEPTOR	LCCATION		EXPECTI	EC ARITHETIC	F	
	KILCPE	TEFSI	30	(MICA)	GRAMS/CL. PE	TER J FT	208
17014	000	000	500	3-422E-10			000
	000	000		000			000
1116		000	000	000	000	000	000
1222	000	10.00 00.00	000	000			900
42:0	000	000	-9.762E-14 0.0 5.800E-10	-1.347E-14 0.0 8.004E-11	3546-1	717E	
1785	6 - 00 000 000 000	7410 000	1.940E-08 2.032E-07	1.3735-06 2.1095-07	781E 319E		4-421E-10 4-868E-09
0717		000	000	000	000	000	000
	000	44.4 000 000	000	000			000
100 mm	000	0000	000	000		000	000
1044 4404	000 000	000	2-520E-C6 7-717E-07 1-096E-07	1.065E-07 3.156E-07	1.071E-C6	2.154E-08 2.146E-08 2.852E-05	1.726E-07 2.784E-08 4.511E-05
1111	000	000	1.019E-06 5.455E-06 2.761E-05	8.927E-01 6.312E-06 2.248E-05	300 046 046	0337 0236 025 025 025 025 025 025 025 025 025 025	2.856E-08 1.12E-03 7.017E-07
444 444	900	000		000	000	000	000
146	00.5	00-5	0.0	0.0	0.0	0.0	

HCNTH # PAY PERICC \* 1200 TC 1300 HOURS ON A WEEKCAY

		ECEFICH CON	CENTRATION C	ATA FACE AIR	PCRT SCUFCES		
FECEFICA NUMBER	PECEPTCA	LCCATION		EXPECTED	ED ARTIFFETIC	FEAN	# # # # # # # # # # # # # # # # # # #
	KILOP	TEFS!	5	E L CHICH	GRAMS/CL. P	TER) FT	205
145	00 00 00	<b>4</b> "	00	00	90		00
-1441 -1441 -1441	999	000		000	000	000	900
4010 014161	900	, , , , , , , , , , , , , , , , , , ,	-3-706E-08	-5-114E-05	316-6	004	-1-817E-05
	000	0000	4000 4000 4000 4000	2521E-0		200 100 100 100 100 100	
0-14 0-14 0-14		000	6-363E-04	7-126E-04	1.633E-C4		0.00 0.00 0.00 0.00
1144 1144	000	200	000	000	000		990
1666	000	000	000	000	000	000	900
	000	900 000 000	519E-0	9-377E-05	-4-718E-67	334	-20-00-00-00-00-00-00-00-00-00-00-00-00-
Make	000	000	1-865E-02 9-082E-03 7-154E-03	9-1786-03	2 - 5 - C - C - C - C - C - C - C - C - C		
100	110000	000	6-809E-03	9.0636-03	1.514E-C3	623E-6	000 000 000 000 000 000
1176	000 000 • • •	000	900	990	000		000
	000	444A 000	000	000	000	000	
400 400 400 400	00	000	00.0	00	00	90	

PENTH = PAY FERICE = 1200 TC 1300 HOURS ON A WEEKDAY

				-					-			-		-	
		205	1.3186-05	0.34 0.36 0.36 0.36 0.36 0.36 0.36 0.36 0.36	3.74.66 3.74.676 0.566 6.04	000	000 000	000	2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-	6.04 6.04 6.04 6.04	000	000	999	1.010E-05 1.037E-06	1000 1000
	PEAN	TER) FT	2-4106-04	047 747 000 000	2. CECE - 0. 2. C.	000	000	800	2 - 545E - 6: 5 - 817E - 6: 4 - 512E - 61	20117 20117 10000	- UDD	000	000	3.1000 3.1000 3.1000 3.0	
PPCRT SCLECES	PECEFICE LCCATION I	CGRAMS/CL. P	.852E-C	1936-0 4766-0	3526	000	000			0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0			000	6.663E-CE 2.823E-CE 2.553E-C	048 044 046 000
ITA FROF AIRS		FC WICH	- € 1 EE-	2.040 6.040 6.040 6.040 6.00 6.00		000	000		. 6683 2683 2683 1000 1000 1000 1000 1000 1000 1000 10	942E-0	9 <b>00</b>			8 055E-06 9 487E-01	9025
ENTRATICA DA		00	1.105E-01	245 2416 6666 6666	6.942E-02 5.086E-02 4.400E-02	000	000		609	9 8 E -	2-104E-01	000	000	5.207E-07 4.818E-04 3.936E-04	1-915E 00 1-207E 000
ECEFTOR CONCE		TEFSI	00.5	0000	000	2:00	67470 000 000	0000	10.00 11.00 00.00	2000	15.00	000	000	6.00 10.00	12.00
		K ILCP	0	000	000	000	000	900	000	000	000	000	000	000	000
	TECEPTOR I				1990		11111111111111111111111111111111111111	200	2002	2002	205 1 205 1 210	- C1/2/2	2012	25/25 26/18 26/18	222

PENTH = PEY FERICE = 1200 TC 1300 HOURS ON A WEEKCAY

		205			000	-5.560E-05	1			000		400 600 600 600 600	47-1 27-0 2007 2007 2000		0.0
	FEAN	TEP) FT				425E-0	520 540 540 56		<b>600</b>	000	0.0 -1.007E-10	2 - 3 - 3 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5	27.00 27.00 14.10 16.10 16.10 16.10 16.10 16.10 16.10 16.10 16.10 16.10 16.10 16.10	600 600 600 600 600 600 600 600 600 600	0.0
APCRT SCLFCE	ED ARITHPETIC	GRAMS/CL. P	3:3016-81	900	000	-2-705E-C7	2.475E-C2 2.180E-C1 6.375E-C1	7.5388-61 6.8358-61 5.7068-61	000	800	9.0 -5.015E-C5	3-982E-C4	2:43:6-66	000 000 000 000 000 000 000 000 000 00	0.0
ITA FRCM AIR	EXPECTED	FCMICE	34.23 3.43 3.643 6.0 0.0	900	000	-2.651E-0E	5.950E-03 9.103E-02 2.525E-01	3:7685-01	000	000	0:0 -4:953E-10	2.066E-05	3-964E-01	2.585E-01	0.0
ENTRATICH DA		9	470		000	-1.950E-07	900	ī	000	000	0.0 0.0 -3.618E-05	2 - 7 - 1 - 1 - 1 - 1 - 0 - 0 - 0 - 0 - 0 - 0		-00	0.0
ECEFTCR CONC	LCCATION	TEFS)	000 000		000	000	12.00	000	000	600 000	000 000	900	000	000	2.00 I
	FECEPTCA	KILCPE	000	000	000	000	000	000	000	000	000	000	61418U	000	16.00
	FECEFICE		1700 1700 1744		17070	0000 01001 01001	2000	2236 245 545		2424	224	2019 2019 2019 2019	000 000 000 000 000	2000 2000 2000	1 255

PENTH = PAY FERICE \* 1200 TO 1300 HOURS ON A WEEKDAY

	u.	ECEFTOR CON	CENTRATION C	ITA FROM AIRPOR	PCRT SCUFCES		; —— ; : : : : : : : : : : : : : : : : : : :
FECEFICE NUMBER	FECEFTCF	LCCATION	\$100\$ (100) (100\$ (100\$ (100) (100) (100\$ (100)	EXPECTED	EC ARITHETIC	PEAN	
	K ILCPE	TEFS)	00	FCMICE	GRAMS/CL. P	TER) FT ]	205
266	16.00	00	00	90	00	00	00
		5.00 	73E-0	0.0 0.0 1.615E-05	62 EF-C	26 E -	0.0 0.0 5.754E-10
222	000	00.00 10.00	2-563E-07 2-394E-06 6-786E-05	303E-0	722E-0 320E-C	66.00 66.00 66.00 66.00 66.00 66.00	
	16.00	12.00	200	523 643 600 600 600	80%	4.00	2.642E-05 2.642E-05 2.563E-05
1222	116.000	15.00	2-460E-01 4-237E-01	20 - 00	90	2 162E - 61 3 - 702E - 61	90
	000	000	000	000	000	000	000
1	900	40.0 000 000	000	900	000	666	000
2 w 2 1	000	000	10.0 0.0 1.832E-08	0.0 0.0 2.52EE-05	0 0 541E-C	00 BE-1	000 000 000 000 000 000 000
W@W 1	000	11-00	966 666 966 966 966 966 966	251E-0 325E-0 30E-0	1129E-5	1030 1030 1026 1026 1030	1000 1000
225	000	000	1-146E-02 5-887E-02 1-545E-01	9130	724E 756E 815E	240 240 240 200 200	1254
85 C	mmm 000	2.00	000	990	000	900	999
222	mam 000	614.0 000	000	000	000	900	000
S	900	90	00	00	00		00

PENTH = PAY FERICE = 1200 TC 1300 HOURS ON A WEEKDAY

	; ; ; ; ; ; ;	\$62	0.0	-00	000	400	000			,			200		2,44 0-00 0-00 0-00 0-00 0-00 1 1 1 1-00
	FEAN	TER) FT I	0.0	5-6766-12 5-5016-05 2-2046-07	- 46.66 - 05.66 - 05.6	-357E-	000		000 013E-1	3010	32 AE - 6	900	900	000	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
PCRT SCLFCES	EC ARITHETIC	GRAMS/CU. PE	0.0	825E-1	100	-785E-C	000	000	0.0 0.0 1.502E-CE	1.1071 1.037E 1.040E 1.055	275E-C 665E-C	000	000	000	8.725E-10 1.175E-67
TA FRCF AIF	EXPECTED	F)	0.0	4.755E-11 2.757E-0E 1.512E-06	464 465 465 465 665 665 665 665 665 665	16E-0		000	-00 -454E-0	1.372E-07 5.370E-06 1.002E-04	126		000		10 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 -
ONCENTRATICA CA		כפ	0.0	3-478E-10 1-97EE-07 7-664E-06	1.073E-04 1.393E-02 1.108E-02	3 78E-	000	000	0.0 0.0 1.083E-08	564m 904m 904m 904m	00 00 00 00 00 00 00 00 00 00 00 00 00	000	000	000	6.292E-10 8.587E-08 2.359E-06
ECEFTOR CONC	LCCATION	TEPS)	E-00	2000	000	00-00-00-00-00-00-00-00-00-00-00-00-00-	000	000	600 000 000	0000	44.0	000 000	40.40 000 000	000 000 ~wo	000
	PECEFTCE	KILOPE	• 1	900 900			000	0000	15.00			000	000	000 000 000	000 000 000
	FECEFICE I		257	1122 0.556 0.556	-7/6; 000 000	uiului 000 441A	91919 000 0471		(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)		1000 1000 1000 1000 1000 1000 1000 100	10000 1000 1004	212C	WSD NORTH	लागना जागना च्याना

PENTH = PRY FEPICE = 1200 TC 1200 HOURS ON A MEEKDAY

	4 4 5 5 7 8 8 8 8		1.000000000000000000000000000000000000	900	000	900	0-0 0-0 4-402E-10	000 000 000 000 000 000 000 000 000 00	0000	900	000	000	4144 1004 1004 1004 1004 1004 1004 1004	244E-0	0.0
	FEBA	_		900			0.0 0.0 2.458E-10	001/H 000/H 000/H	000			800		6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	
CRT SCLFCE	C ARITHETIC	AMS/CL. P		000			0.0 0.0 1.245E-CE		208E-C	1		000		00 00 00 00 00 00 00 00 00 00 00 00 00	
ITA FROM AIRE	EXPECTE	FEFE	1.520E-C: 1.710E-04	000	000	000	0.0 0.0 1.239E-05	8 182E-06 3 2 341E-06 3 2 6 2 E-06	400 500 6	000	000	000	1.355E-10 1.076E-06 3.663E-07	281E-0	0.0
ENTRATICN CA		CC	2.083E-05 2.236E-04	000	000	000	0.0 0.0 8.977E-05	285 285 285 600 600	625E-0	000	000	000	9.851E-10 5.532E-08 1.052E-C6	.149E-0 .812E-0	0.0
ECEFTOR CONC	LCCATION	TEFS)		000	000	000	000	000	000	000 000	000	000	000	000	1.00
<b>α.</b>	RECEPTCE	KILCPE	000	000	000	000		000	000	900	000	000	000	000	9
	FECEFTCE NUMEEF		meim i	CHOCK I	4441	4441	444 0000 4000	4 RUAL I		GIGIGI	RIRIA	222	4414 4414	(1)(1)(1) (1)(1)(1) (1)(1)(1)(1) (1)(1)(1)(1)(1) (1)(1)(1)(1)(1) (1)(1)(1)(1)(1) (1)(1)(1)(1)(1) (1)(1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(1)(1) (1)(	370

PERTH - PAY FERICE - 1200 TC 1300 HOURS ON A WEEKDAY

		\$5.2	00	500	900	0.0 4.007E-12	6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00	000	900	500	000	6-1436-11 2-1236-11 2-1236-05	1.455E-07
! ! ! ! !	FERN	TER) FT ]	90	000	900	3-065E-12 2-254E-1C	7 - 56 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 -	900	900		500	3-46-E-11-4-207E-05	1.36:E-06
IRPORT SCURCES	C ARITHMETIC	GRAMS/CC. PE	00	000	000	1.538E-10	2.5146-C1 1.7946-C6	000	000	000	000	1-7366-65 4-8966-65 6-0656-63	4.614E-CE
TA FROM AIRP	EXPECTED		00	000	000	0.0 1.530E-11 1.452E-05	1.923E-06 1.327E-06	900	000	000	000	1.725E-10 9.784E-05 2.340E-07	3.02EE-06
CONCENTRATION CA		8	00	000	000	0.0 1.109E-10 8.351E-05	2.453E-07 2.170E-05	000	000	000	000	3.023 3.023 5.4026 1.03 1.03 1.03 1.03 1.03 1.03 1.03 1.03	5.089E-06
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	KILCP	TEFS )	ຍ	FCMICA	GRAMS/CL. M	TER! FT	205
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PENTH - PAY NEERICE - 1200 TO 1300 HOURS ON A WEEKDAY

RCNTH = PEY FERICE = 1200 TO 1300 HOURS ON A WEEKEAY

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PENTH - PAY PERICE - 1200 TO 1300 HOURS ON A WEEKDAY

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PCNTH = PAY FERIOC = 1200 TG 1300 HOURS CN & WEEKDAY

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	20	1.620E-01 2.465E-01 4.358E-01	000	000	0.0 0.0 1.649E-09	4.548EE-03	9000	02E-0	000	000	9.224E-05	1.465E-03 4.768E-03 1.878E-03	3-813E-02 1-404E-01
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PCNTH = PLY FERICC = 1:00 TO 1300 HOURS ON A WEEKDAY

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FEAN	TER) PT	90	000	900	4 • E67E • 03 5 • 645E • 02 1 • 045E • 02	200	000	300 000			6-1816-03 2-7866-02 7-4666-02	1.5416-01
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EXPECTE	1 T T T T	90	000	000	2-210E-04 2-740E-04 5-351E-04	447 647 647 647 647 647 647 647 647 647	000	000	000	0.0 0.0 2.343E-04	2.02EE-04 2.657E-03	5.762E-02
	CC	00	000	000	6.851E-04 8.200E-04 1.632E-03	5-139E-03 1-844E-02 3-615E-02	000	990	000	0.0 0.0 6.953E-04	9.091E-04 4.638E-03 9.750E-03	2.025E-02
LCCATION	TEFSI	90 90 (VIII)	4#/# 000	0000	000	12.00 000 000 000	000	600 000	000	10.00 11.00	000	15.00
RECEPTOR	KILGYE	00	000	222	000	000	2777 244 000 000	000 000	000 000	1417V 000	200 000	24.00
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	RECEPTOR LCCATION I EXPECTED ARITHMETIC	RECEFICE LCCATION I EXPECTED ARITHMETIC MEAN (KILCMETERS) T CC I FC PICAGGRAMS/CU. METER) PT I	KAILCPETERS)  (KILCPETERS)  (K	RECEFICE LCCATION  EXPECTE LCCATION  EXPECTE ARITHETIC VEAN  EXPECTE ARITHETIC	RECTECT LCC	## FECFFICE LCAPION    KILCFFIES   V	RECEFICATION  222	RECEPTOR LONG		EXPERIENCE DO CO	EXPECTED NO. 000 000 000 000 000 000 000 000 000 0	TATE OF THE PARTY

PENTE - PEY PERICE - 1200 TO 1300 HOURS ON A WEEKDAY

		99-02-77				0-0	CI-ERO	4)(~8)	V0-	Dui-	KIWP-	925 925		-
	PECEPTCF	XXICP	990	000	990 990	000	<b>00</b> 0	000	000	000	000	000	000	000 000
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ATA FRCP TCT	EXPECTEC	I KCRU	900		600 600 600 600 600 600 600 600	3.576E 00 2.616E 00 1.625E 00	5.934E-01	0.0 0.0 0.0	1-6-941E-07 5-257E-03	2000 2000 2000 2000 2000 2000 2000 200	1 0 0 3 E 0 1 E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.368E 000 0500 0500 0000	1-008E 00 5-2-00E 01	0.0 0.0 -6.578E-06
AL SCUFCE	EC ARITHETIC	GRAMS/CU. P	000	1-641E-C# 1-691E-C# 6-915E-04	4M4 1	1 8 5 E C		1.732E-C1	-3.005E-C7	955E	3:443 20		3:431:61	0.0 -2.835E-C6
	TEPS .	TER) FT	900	24-2 64-2 74-2 74-2 74-2 74-2 74-2 74-2 74-2 7	22 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	823 600 623 600 600 600 600 600 600 600 600 600 60	947 947 990	00.0 00.0 00.0 00.0	-10-0 -10-16-26-07 -10-16-07			### ### ### ### ### ### ### ### ###		0.0 -1.055E-06
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MCNTH = MEY FERICE = 1200 TC 1200 HOURS CN A WEEKDAY

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	FEAN	TER) FT	105E-0	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	100 mm		755E-0	1 CONTO	2000 1000 1000 1000	200 200 200 200 200 200 200 200 200 200	200 200 200 200 200 200 200 200 200 200	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-4-576E-05	174.4 174.8 170.1 170.1	2.614E 00
AL SCLECES	C ARITEMETIC	GRAMS/CL. FE	-036E-C	1 200 1 200 1 200 1 200 1 200	3-912E CC 1	9946	273E-C	240E-0		203		O EE O	1-18:E-04-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	1 40.0 1 11.00 1 11.00 1 11.00	32
TA FRCH TCT	EXPECTED	1	25.00 25.00	900	24.5 24.5 24.5 Emm	150E 0	0 266E-0	5-885E-01 3-527E-01 1-940E-01	2.655E 01 2.775E 01	200 200 200 200 200 200 200 200 200 200	722	00 52 E Q		480E 0	3.2546 81
CENTRATICA CA		00	364E-0	1.146E 02 1.050E 02 9.175E 01	510	.218E 0 .086E 0 .824E 0	0.0 0.0 -3.002E-04	3-355E 00 2-011E 00 1-106E 00	000	40-	23E 68E 68E 000	0.0 0.0	-1.562E-03 1.540E 01 1.016E 01	1-406E 02 1-607E 02 1-755E 02	1.8446 02
ECEFTCP CCN	LCCFTION	ETEFS)	000	7.00 6.00 7.00	11:00	14.00	1.00	5,413	000	10.00	12.00	16.00	4 9 4 9 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000	900
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beds	NCFETCE I	of pad justice	ener ww		444)	444 ALA	44141 A0141	ואושו	10000 10000	M. 20	444	48.0	-ws	047	

PENTH = PEV FEPICE = 1200 TC 1300 HOURS GN & MEEKCAY

		ECEFTOR CONC	ENTRATION CAT	TA FROM TCT	L SCURCE		
FECEFICA NUMBER PREF	RECEPTUR	LCCATION		EXPECTED	ARI	PEAN	
	XX 110 P	TEFS)	נ	T T T T	GRAMS/CL. PE	ETEP) FT	203
3	4.00	10.00	6-165E 01	1.088E 01	446E C	1 (	
	000	000 000	464 mmm	55.00 54.45 66.00 600	23.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	6-1116-01 4-5336-01	6.026E-61
- 60 W	44m 000	4410	2.805E 01 2.461E 01	945E	000 000 000 000 000 000 000 000 000 00	4-727E-01	
(AU)4.	000 000 4	000 000	1.886E 01 -4.432E-03 5.082E 01	3.365E 66 -7.775E-04	3.9566 3.9566 3.8566 6.00		-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-0-1-
WE WE	000 000 000	4114 000	-3728E 0	542 542 543 666 666	800 200 2130 mmm	04.0 02.0 04.0 04.0 000	21-61-5 1-3-7-61-5 1-3-7-61-6 00-6-1-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6
8000	900 900	000 000	624E 802E 163E 0	840 586 5385 600	4-00 mmm	2.53 8.23 8.23 8.23 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.0	
-255 555	900 900	000	7.956 01 7.956 01 4.666 01	1.037E 01 8.155E 01	5-25aE 60 3-375E 60	4774 727 727 727 727 727	
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~@v	900	000	90	448E-0	251E-C	43E-0	000 000 000 000
0000	999 999	000	1-212E 02 9-910E 01 1-192E 02	2-127E 01 1-738E 01 2-059E 01	MUM MUM MUM	20081 2000 40101 2000	
000	000 000 ••••	000	1.360E 02 1.335E 02 1.513E 02	2.358E 01 2.671E 01	9.891E CO 1.055E CO	4104 4104 mmm	2.524E 2.524E 2.524E 2.524E
1000 000 000	999	000	1.034E 02 1.316E 02 1.457E 02		7-46CE 9-46CE 1-05CE C1	2.25 2.25 2.25 2.25 2.25 3.25 3.25 3.25	
50-4 0-4-4 -4-4	999 999	000	6-257E 01 4-954E 01 7-100E 01	1.054E 01 8.656E 00 1.251E 01	26.25	2000 2000 2000	440 640 600 600
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MCNTH = PAY PERICE = 1200 TO 1200 HOURS ON A WEEKDAY

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			655E 0	\$ 36.26.00 \$ 05.76.00 6 705.600	2012 0012 0010 0010	000	-0066 -7266 0 -960	4-022E 00 2-285E 00 4-7-E 00	000 000	1-17E 4-913E 00	-471E -960E -638E	123E	269E 200E	6.7116-04 6.656-004	1.1916 01
	FEAN	TER! FT	257E 0	346E 0	250 250 250 250 250 250 250 250 250 250	600 600 600 600	\$ 22E 211E 526E	04.0 04.0 04.8 04.8 04.8	22,25	000 000 000	8.00 8.00 8.00 9.00 9.00 9.00 9.00	2017 2017 2017 2018 2018	144 144 164 164 164 164 164 164 164 164	-2- -2- -2	9.166E CO
SCUFCE!	D ARITHMETIC	GGRAYS/CL. PI	4.474E (0 0.0 -1.11(F-C3	000	2000	26.44 26.44 20.00	400		1,000	102E	-431E -275E	400 400 400 400 400 400 400 400 400 400	262 262 863 863 866 866 866 866 866 866 866 866	10-494 10-175 10	2.035E C1
TA FROM TCT	EXPECTED	MICE	00 K	3.758E 0 3.758E 0	100 832E 01	.052E 974E 0037E	250E 355E 422E 0	8000	6404 640 640 640	- 862E - 818E - 124E - 0	5.54.2 5.56.8 5.50.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.00.0 5.	248E 0	247 000 000 000	273E-0 723E-0 516E-0	5.123E 01
ENTRATICA CA		נט	045E 0	165E 104E 004E	1785E 102E 005E	163E 0 013E 0 548E 0	890E 376E 0	1.027E 02 1.027E 02 1.029E 02	643 643 645 645 645 645 645 645 645 645 645 645	925 935 900 900 900 900 900 900 900 900 900 90	713E 0 571E 0 345E 0	000	1227 7025 7025 7025 7025 7025 7025 7025 7	-7-255E-03 2-552E-03 2-552E-03	2.558E 02 I
ECEPTOR CONC	LCCATION	TEFS)	000	000	000	6.00 00.00 00.00	000	4410 000 000	000 000	48.40 000	2 000 000 000	000	000	000	3.00
	RECEFTCF	KILCPE	000	000	000	000	000	000	000	000	990	900 900	000 000	000 000	2.00
	FECE FEE FEE FEE				115	1222	459 1754 1754	126				2044 004	444		1 148

PCNTH = P.EY PERICC = 1200 TC 1300 HOURS ON A WEEKCAY

		EFTCR	CCACENTRATICA C	ATA FROM TCT.	AL SCLECE		† † † ! !
FEC 64 1	RECEPTCA	LCCATION		EXPECTED	ARI	**************************************	• • • •
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480	000	4.iv	2.085E 02	1 59E 0	583	1636	1576 88
	000 000	000 000 vra	700 700 700 700 700 700 700	24.0 24.0 24.0 26.0 26.0 26.0 26.0 26.0 26.0 26.0 26	200 000	1000	279
denn Anna Anna Anna Anna Anna Anna Anna A	000	10:00	1306	3-8456	7346	12120	9000 9000 9000
	000	000	000 000 000 000	945 645 645 645 645 645	837E 234E 116E	000	757E
0 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	000 000	1.00	2000 2000 2000 2000	-6.556E-01	3136	4112	647E
<u> </u>	000	000	300 300 300 300 300 300 300 300 300 300	000 000	000	6.14 2355 2355 2355 2355 2355 2355 2355 235	
165	900	900	1-2-207E 02 1-1-21E 02	6-068E 01 2-150E 01 1-534E 01	1-0W	200	4.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00
171	990	900 000 000	9-986E 01	23.33.6E 23.33.6E 23.36E 23.36E 23.36E	1-225E 6-122E 7-14EE 600	244 244 240 240 240	4416 4416 972 972 900 900 900
172	900	1 2 000	3172 3172 605 605 605 605 605 605 605 605 605 605	# 100 100 100 100	004 044	446 446 4424 4424 4424 4444	4.44 0.00 0.00 0.00
115	000		405E 326E 067E	6-16-16-01 6-004E-01	4004	425 425 600 600	000 000 000 000
1126	990	0000	969E	47.4 04.4 000	5954 6354 6354 6354 6354	24.2 24.2 26.2 26.2 26.2 26.2 26.2 26.2	
	000	44/4 000	5.989E 02 1.611E 02	1.226E 02 3.335E 02	5-184E CI 5-462E GI	4.007E 01	4.7.1 4.7.2 4.4.2 1.4.2
4.8.	00	000	9-773E 01 8-129E 01		2.272E (1	7-897E 99	3.2556

MENTH - MAY FERICE - 1200 TG 1300 HOURS ON A WEEKDAY

7.07 7.07 7.07 7.07 7.07	RECEPTOR	LECATION		EXPECT	EC ARITHETIC	E P P	
	KILCPE	ETEFS)	5	MICH	GRAMS/CL. P	TER) PT	
186	11.00	00*5	1.865E 02	5.526E C1	1.354E C1	7.83EE 01	4.401E 00
- 95 98 100 100 100 100 100 100 100 100 100 10		10000	1-183E G2 5-338E 01 2-968E 02			7426 5666 0156	13.518E 000
DH261	000	41441 000	000	8 5 4 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	63.3 83.5 90.6 60.6 60.6 60.6 60.6 60.6 60.6 60.6	-44 -45 -45 -45 -45 -45 -45 -45 -45 -45	4424 4224 6966
11000	000	000	1000	829		446 604 604 600 600 600 600 600 600 600	2254 2274 2274 2274
200 200 200 200 200 200 200 200 200 200	000	000	530E 070E 075E 0	200 200 200 200 200	1111 5626 8226 0	24626 24626 24626 24626 24626	283E 0 411E 0
200 200 201	000	000-4 	1-324E 02 9-528E 01 8-823E 01	2.277E 01 2.277E 01 2.282E 01	N84	441 641 641 641	-06 EE 0 -192E 0
202	000	10.00	2027E		4420 024E	1 - 5 5 5 E 0 1 2 - 5 7 3 E 0 1	42.6
200 200 200 200 200 200 200 200 200 200	200	12.000	I PLINO	333E	72.20 6.00 7.2.20 6.00 6.00 6.00 6.00 7.2.20 6.00 7.2.20 6.00 7.2.20 7.20 7	1000	7.000 7.000 7.000
206 205 210	000	1.00	- 58 - 79 - 85 - 85 - 85 - 90 - 90 - 90 - 90 - 90 - 90 - 90 - 90	7.52E 242E 245E	6564 4064 1016 1016	542E-421E-	1 - 295E - 01 - 295E - 02 - 02 - 02 - 02 - 02 - 02 - 02 - 0
212	000	2.00 9.00 4.00	244 744 747 747 747 747	1.352E 01 1.841E 01 2.584E 01		500 500 500 500 500 500 500 500 500 500	2.424 2.624 3.655 6.00 5.00 5.00 5.00 5.00 5.00 5.00
2712		000	2003E		8414 6414 6414 600	3441 3441 3461 3611 3611	900 900
217 218 215	900	6-00 5-00 0-04	7.535E 01 9.838E 01 1.295E 02	1.024E 01 2.611E 01 3.585E 01	7-376E CO 1-195E CO	5452 5452 9466 9466 9466	6000 6000 6000 6000
220	000	32.000	1.794E 02 1.953E 02 2.781E 02		3600	23 CE C 6066 C 5266 0	

MCNTH - PAY PERICE - 1200 TG 1300 HOURS ON A WEEKDAY

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	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	205	1004	5.44 5.44 6.44 6.44 6.44 6.44 6.44 6.44	6913E 935E 935E	426	1000	2000 6000 6000 6000		2000 1000 1000 1000 1000	2014 0114 0114	242	247. 447. mmm	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	6.1566-04
; ; ; ; ; ; ;	FEAN	TER) ET	22.0 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 2.1.1 3		1000 1000 1000 1000	240	1616 4526 6246 000	044 mmm	2000 2000 2000 2000	24.55 24.56 24.66 24.66 24.66 24.66	4.00 4.04 4.04 6.00 6.00 6.00 6.00	24.0 24.0 24.0 20.0 20.0 20.0 20.0 20.0	2000 0000	-	5.002E-04
1 SCUPCES	C ARITHETIC	GRAMS/CL. P	2-59!E CI	7216-C	6.5676 60	3546	000	12 EEE		1000 11111100 11111100	446 000	2000 8800 8140		804 804 800 800 900 900	1.707E-C3
TA FROM TOTA	EXPECTED	STATE OF	5-856E 01		DI-IN	543 522 527 6	-50	2000 2000 1000	9000	N40	NEO	855 855 855 865 865 865 865 865 865 865	3.450E 01	-00 0mv	4.058E-02
ENTRATICK DA		5	2-9356 2-5376 1-1576 1-	303E-06	929	9413 9625 825 825 825 825 825 825 825 825 825 8	724 062 318	-364 -3696 -1356 -1356 -1356	3656 656 666 666 666 666 666 666 666 666	0.00 mmm		400 400 400 400 400 400	711E 967E 0 9691	000 000 000 000	2.367E-02
ECEFTCA CONC	LCCATION	TEFS)	44.0 000	000	441A	C 800	000 000	600 600	000	414.87 000 000	000 000 v~w	200 000 000	000 000	200 200 000	2.00
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